

CHAPTER II

THE SETTING

1. Geography

Although several good descriptions of the physical environment and general culture of the Orokaiva are available (e.g. Williams 1930, Waddell and Krinks 1968), a brief sketch of the setting of this study may be convenient. The Orokaiva live in the Northern District of Papua, a district bounded on the south-west by the Owen Stanley range, on the west by the Mandated Territory of New Guinea. Although the administrative centre of the district, Popondetta, lies only about 150 miles from Port Moresby, there is no road connection, so that the only communications with the outside world are by air and sea.

The Orokaiva live on the footslopes of Mount Lamington and on the plains to the north and east of these footslopes. This region is, by New Guinean standards, highly favoured by nature, as Brookfield recently emphasised (1966). In a classification of the natural resources of New Guinea according to the degree of limitations to land use¹³³, Brookfield describes a large territory surrounding Mount Lamington as 'suitable for cultivation with a mild degree of limitation'. This comprises 'some of the largest tracts of such good land in the whole country' (*ibid.* 47-8).

One distinguishing feature of the region is its lithological composition: there is an abundance of Pleistocene and recent volcanic deposits. The total area of such recent ash and lava deposits found in New Guinea is small, but notably fertile. Brookfield maps the annual rainfall of the region as between 100 and 150 inches. This is not so high that the land becomes permanently or semi-permanently waterlogged. On the other hand, the region mostly lacks well-marked dry seasons during which the soil would rapidly dry out. With regard to terrain, the region has extensive areas of low and moderate relief and good drainage. As for density of population, Brookfield paints a somewhat idyllic picture that needs correction: 'the greatest concentration of population, rising locally to 60 per sq. mile, lies on the best land in the area - the little-dissected footslopes of Mount Lamington, where smooth topography is combined with fertile soils and good drainage' (*ibid.* 64).

We find, in fact, that local densities of 200 and more per sq. mile are not at all rare (Rimoldi 1966: 4). In two villages I surveyed, I found population densities to be 180 (Sivepe) and 135 (Hohorita) per sq. mile. Rimoldi's analysis shows that the Sivepe population density is close to the upper limit the land can sustain with present technology and social organisation. The sample he chose (50 persons of the Jegase and Timumu clans) happened to have under-average land holdings, of 138 acres. Rimoldi shows that 110 of these acres are needed for

231 but which, as Williams says in his discussion on Orokaiva domestic animals (1930: 60-3), are all ultimately destined for the pot. The fowl population has likewise remained more or less constant for some time (e.g. about 30 in Inonda, 235 40 in Sivepe). The birds are useful not only as a source of meat and eggs, but also of cockerel feathers which are plucked and used for decoration on headdresses, spears, etc. Unlike the dogs, the fowls are no longer a purely indigenous variety: they have been crossed with Rhode Island Reds introduced in the 1950s.

231 A few years before I did my fieldwork, the government began a vigorous campaign to eliminate pig husbandry from Orokaiva villages, in an attempt to improve village hygiene. Though this campaign generally was not very successful, domestic pigs had all but disappeared from the villages where I stayed. Like the other domestic animals they were left to forage for food most of the time but were also fed with pieces of taro and other left-over food, as well as pawpaw, coconut, etc. They mostly slept under the houses, but were free to roam. Males [174] were castrated and females were fertilised by boars roaming in the bush. A close [1825] quasi-kinship link was assumed to exist between the pig and its keepers, and this was emphasised by taboos on eating a pig reared by a close relative. Techniques of domestication will be discussed below.

241 *Horticulture.* The Orokaiva word *pure* has at least two important meanings: 'work' and 'garden'. As elsewhere in Papua-New Guinea, the garden is a centre of sexual, social, religious as well as industrial activity.

The main product is taro which occupies perhaps nine tenths of the area. But a great variety of other plants are also found: banana, sugar-cane, edible pitpit, German taro (*xantosoma*), a few introduced vegetables such as pineapples, tomatoes, beans, and some sweet potato. Some trees may also be planted though these will not bear until long after the garden has been abandoned: breadfruit, *tauga*, coconut, areca. In addition there are always some herbs and medicines, and if the gardener is a professional medicine man there will be a great many of these. Yams are grown in separate gardens.

Very full data on the size of these gardens have been provided by Crocombe and Hogbin (1963) and Rimoldi (1966). A household tends to establish something like one and a half to two acres of garden per year. A garden is never used for more than one taro season, but as planting and consumption of the taro each tend to be stretched over most of a year, almost two years elapse between the clearing and final abandonment. This gives time for the bananas and sugar-cane to reach maturity too. Once a garden is abandoned, it is not used again for at least eight years or so. The usual swidden agriculture techniques are used, burning, clearing, careful removal of 'rubbish' remaining after the burning process, planting with a digging stick, periodic attention to weeding and heaping up of earth around growing taro, removal of corm-bearing bases of petioles of [242] mature taro for removal and planting in a new garden. The Orokaiva practise no irrigation, no form of terracing or drainage, no manuring, no measures against parasites. Sometimes a fence is made out of tree trunks to keep pigs from breaking in. This is usually done only after a pig has made its first expedition, and only on the side where the pig entered.

• [132] While planting and harvesting proceeds almost throughout the year there are important seasonal variations that should not be ignored. There is a dry and a

241 wet season throughout the Northern Territory. On the Mount Lamington
 [132] foothills, the dry season is comparatively short and somewhat undependable, but
 it is usually over by the beginning of September. Here cultivators must be sure to
 have enough dry weather for a successful burn prior to planting. 'A significant
 proportion of the mineral energy upon which swidden cultivates draw for their
 growth comes from the ash remains of the fired forest, so that the completeness
 with which a plot is burnt is a crucial factor in determining its yield, a fact of
 which probably all swidden cultivators are aware.' (Geertz 1966: 22-3)
 Furthermore, it is unwise to leave the burn until too late in the dry season, for if
 the soil has dried out (which it does quickly in the tropics), taro plants develop
 few shoots, so that the gardener may be short of shoots for planting out. Hence,
 I was told, a very substantial amount of clearing and planting needs to be done
 between June and August. There is thus a flush of produce nine or ten months
 later, i.e. from April to June. The same rhythm also applies in drier areas, nearer
 the coast, such as Inonda, because there the danger of the soil drying out is even
 greater and the dry season much longer. When we find that the principal
 Orokaiva feasting season is from April to June, we can see that this is
 ecologically determined, as it is then that taro is most plentiful.⁵

243 While most subsidiary crops are grown in the taro garden, it is a fixed rule
 476 that taro and yam should never be grown together. While taro is usually grown
 by individual households, yams are planted and harvested by co-operative
 groups, around the same time as the main taro planting and harvest, but yams
 are usually stored for several months until the next dry season. Yam houses are
 built in yam gardens and used for the storage of no other crop.

245 *Arboriculture.* Although the Orokaiva traditionally planted coconut, betel-
 nut and a few other trees in gardens, villages and in the bush, their arboriculture
 249 used to be rudimentary in comparison to their precise and detailed attention to
 177 tubers, especially taro. The Australian authorities had hardly established
 473 themselves in Papua before they began to press the population into extensive
 arboriculture that would yield a cash income. One of the early 'native
 regulations' (No. 121, passed in 1903), compelled all Papuan villages to grow a
 stipulated number of rubber trees. Three such rubber stands were established at
 Sivepe, ranging from one half to three acres in area, all village men supposedly
 sharing in the work. Rimoldi (1966: 86-93), who describes in detail the
 vicissitudes of exploitation of these trees, shows how ill-adapted communal
 rubber stands are to a society lacking institutions for the distribution of
 corporate assets to its members. Nonetheless, a further stand was established,
 this time quite voluntarily, in 1964. They are known as the 'company trees',
 have not yielded any cash, and will be discussed in detail below as the land
 transactions involved cast light on the ideology of contemporary Orokaiva
 co-operative movements.

245 'Communal' village plantations for coffee were established in the Northern
 473 District under the same regulations as applied to rubber, but all producing trees
 in the villages I visited had been grown on quasi-individual holdings. First
 plantings were around 1955. On a rough estimate I would say that the number
 of trees in Sivepe and Hohorita, two villages on the foothills, were 3,500 and
 15,000, while Inonda, on alluvial plains, had 800. Coffee is one crop that

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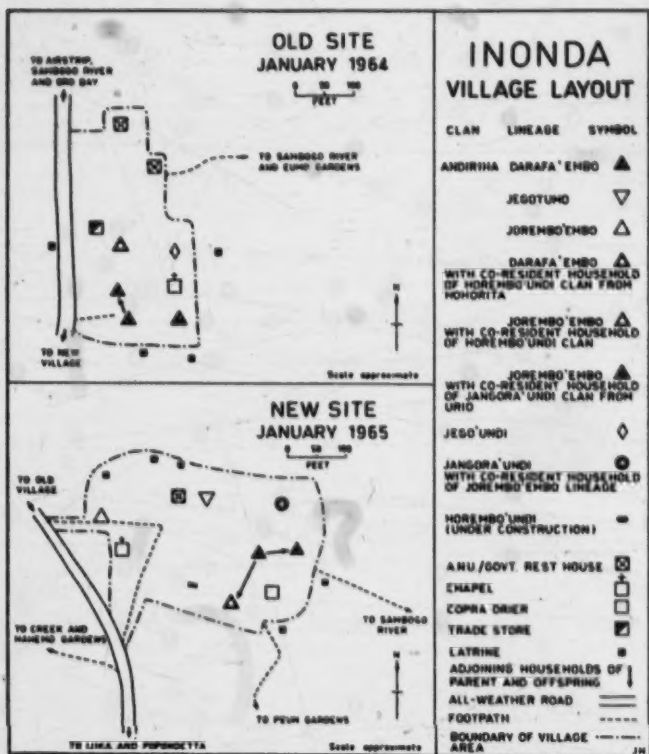


Fig. 4. Inonda village layout.

The leader, a government driver, earned about 65 per cent of the total cash income of the whole village, not only in wages but also through various enterprises on the side. He was the lay preacher as well. The only limit to his influence was the unwillingness of the pagan faction to become involved in "modern" activities of which he was the champion.

Ecologically, Inonda is characteristic of the alluvial plains region to the east of the mountain. It lies between 200 and 300 feet above sea level, and has a comparatively low rain-fall and long dry periods. Its population density is low: 42 people on a village domain of 2850 acres (less than 10 per square mile). The best Inonda land is 580 acres of coarse-textured recent riverine deposits, covered with forest or regrowth and lying beside the Sambogo and Girua rivers.

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Hohorita. My stay in Hohorita lasted for a month, and I made several return visits. This village lies thirteen miles from Popondetta on the road to Saiho, has forty-one dwelling houses and a population of 358. Hohorita and three contiguous hamlets are the home of the Sangara who survived the Mount Lamington disaster. The Sangara population was reduced by the eruption from some 3,000 to 195 people, who stayed together in the evacuation camp and later founded Hohorita, where the remnants of about a dozen clans may be found. By far the strongest clans in this village are those whose homes, at the time of the eruption, were at the outer edge of the devastation area and who were able to run away from the *nuee ardente* before the searing blast could reach them. 101 105

Hohorita, though built much earlier than Inonda (1957), was not beautified with the same care. The area between the two rows of houses was bare, except for some coconut and betelnut palms. The village was divided into two rectangles by a short row of houses. The front and back part were settled at different times and different clans were dominant. When I was working in the front half I would meet hardly anyone from the back half and vice versa. A feast house had been built in both the front and the back sections of the village. The feasts had been held just a few weeks before my arrival, to entertain neighbouring villages. Originally a combined feast had been planned, but disagreement had prevented it. There was no chapel in the village, but a mission station just next to it, with a white mission teacher, a mission school and several Papuan teachers who were in charge of church services. This was a contrast with Inonda, which was several miles removed from a school and even further from a mission. There was a woman's club with a small club house, but again this was supported by only a small minority.

Hohorita was entirely Christianised, in the sense that everyone had been baptised. A number of the older men had been educated in a mission station prior to the eruption and had become mission teachers while evacuated. When coffee became a lucrative cash crop — more lucrative than teaching — many of them had retired to the village. As a result the leadership pattern differed sharply from Inonda. About twenty men in Hohorita had held down occupations requiring some European skills, and these men tended to work out together the everyday and long-range decisions required in the village. The leading personality was, at that time, a well-educated man, who for years had been the chairman of the Higaturu Local Government Council. In Hohorita virtually everyone was growing coffee. Some men worked in the plantations nearby.

Ecologically, Inonda is characteristic of the alluvial plains region to the east of Lamington foothills. Before the eruption, the concentration of population was entirely on the higher reaches of the tribal domain as rainfall and fertility are higher there. The lower portion of the territory, away from the mountain, was used for hunting. But the government discouraged reoccupation of the higher land, for fear of further eruptions. Hohorita is lower down than the old villages. The more elevated land is used a little less than before, and often for coffee rather than subsistence crops. The topsoil is volcanic loam; the rainfall is probably between 120 and 150 inches per annum. Population density is 135 per sq. mile. This is a little less than is usual on the Mount Lamington foothills, but prior to the eruption the population must have been very dense indeed. 133 311 34 32 161

Sivepe. I stayed in Sivepe for about nine months, from September 1966 101

423 obstacles,¹ but the policy of registering villagers' land was being implemented at the time of our surveys.

121 Inonda and Sivepe alike had experience with their council's registration scheme. The principal reason for working with these villages in particular is that they may be regarded as typical of two extremes among local communities in the council area. The following conspicuous variation was taken into account, in view of the need to investigate the relation of local conditions and problems to economic change in general and to the council's tenure scheme in particular.

161 Sivepe is located in the Saiho Census Division which has an overall population density of 75 persons per square mile, but there are local concentrations of much higher density, for example, 237 persons per square mile at Sivepe;² the density of the Saiho Division is the highest in the Northern District and the third highest among the rural census divisions in Papua,³ but does not approach the densities found in several places in the New Guinea Highlands.⁴ The density of the Buna Census Division where Inonda is situated is about 8 persons per square mile, the lowest among the Orokaiva.

133 The average size of Saiho villages is about 175 persons, compared with an average of 100 in the Buna Census Division. The Sivepe people live on the highly fertile slopes of Mt Lamington, receiving an annual rainfall of about 160 inches; Inonda's land is lower, flatter and comparatively poor and receives about 95 inches a year. Inonda is 11 miles from Popondetta on the road to Oro Bay and Sivepe is roughly twice as far from the township, along a road leading inland.

101 For brevity we will speak of the 'mountain Orokaiva' as an alternative to 'Mount Lamington Orokaiva'. (See Keesing 1951:5-6.)
133 This group, we believe, was the largest socio-political unit, the
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[TEXT CONTINUED ON PAGE 6]

¹ For an account of the developments of the registration scheme see Crocombe and Hogbin 1963:89-93.

² Population is over 8,000 and there are 8.6 acres available per head in the census division. The personal opinion of at least some local officers has been that local densities of 200, and more, persons per square mile are not at all rare in the division.

³ After Kaipi, Gulf District and Kuboma, Milne Bay District.

⁴ However, Keesing (1951:2) maintained that these Orokaiva on the Mt Lamington slopes achieved 'perhaps the densest settlement patterns of any of the shifting "dry" cultivators in the New Guinea area'.

Chapter 2

The subsistence economy

a. Climate and soils

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The neighbourhood has a warm, moist climate with an average annual rainfall of 160 inches (see Appendix C).⁴ Sivepe is between 1,250 and 1,300 ft above sea level and nights are often cool. According to the C.S.I.R.O. soils survey (1954:11), the village is on a soil association of the Awala land system which has an 8-12 inch very dark brown top soil. Chemical tests suggest that these loams are fertile, rich in nitrogen and phosphorus. The fine-textured subsoils range from 10 to 22 inches in depth. The terrain is characterized by a gentle radial slope on wide planar ridges between the larger steep-sided streams flowing from Mt Lamington (5,634 ft) into the Kumsi River. Numerous smaller creeks, together with these streams, form an effective fine-textured radial drainage system.

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The local people recognize 5 types of soil based on differences of colour, texture and moisture.¹

- ¹ (a) Hohori - any red soil; 2 subtypes are distinguished:
i. without sand. This is popular for cultivation; ii. sandy. Avoided if possible as taro does not grow well in it.
- (b) Gindiri - any soil which is stony or has a high sand fraction. It may be used for cultivation but in the dry season taro grown in it becomes stunted and the corms are small.
- (c) Mume - this soil is the predominant type in the area. It is the dark brown loam described in the C.S.I.R.O. report as covering almost the whole of the soil association. It is certainly the most widely used and together with Hohori, type i., it gives the best yields.
- (d) Pusu - any clay. Taro growth is stunted.
- (e) Pegara - swampy or waterlogged soils. These are sometimes used during a dry season.

A, [See Category 132, p. 109--Analysis]

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The C.S.I.R.O. (1954:12) reported that a wide range of annual and perennial crops which will grow at altitudes up to approximately 1,500 ft and do not require a marked dry season could be grown successfully. The report commented that the whole land system is a very good agricultural area and that this is reflected in the relatively dense population,

a factor which under the present system of native agriculture will influence the extension of European agriculture. The potentialities of the area, however, far exceed the present land use, which means there is scope in this area for the successful application of extension work directed to the improvement of native agriculture and horticulture.

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The natural vegetation of the area is a rainforest climax (*Pometia pinnata-chioscheton* sp. Alliance), of which very little remains. A belt of primary and secondary rainforest separates the settlements on the mountain slopes from their northern neighbours but the area south of this belt is mostly covered with more recent secondary growth in various stages of regeneration after cultivation. Isolated patches of 'kuna' grass occur (mainly *Saccharum spontaneum*, with some *Ropelia*, *Imperata* spp.)¹ but their area is insignificant by comparison with the grasslands found on the Orokaiva plains.

b. The cultivation cycle

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Over a period of 8 years the average monthly rainfall has ranged from 9.6, 7.9 and 8.2 inches in June, July and August (when rain falls about 15 days per month) to 20.9, 16.8 and 17 inches in December, January and February (with 22 wet days per month). The coefficient of seasonal variation used by Brookfield and Brown (1963:20) indicates only slight seasonal variability in the area.² An occasional brief drought is possible at any time, but with good soil, and no marked dry season, conditions for the growth of subsistence crops are usually favourable throughout the year and new gardens can be made as needed.³

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¹ District Agricultural Officer: personal communication.

² The coefficient of seasonal variation was 0.30. This measure is obtained by calculating from rainfall figures the standard deviation of monthly means from the mean of the monthly means and then dividing the standard deviation by the mean of the monthly means.

³ We found no effects in this area of the rainshadow zone referred to by Keesing, 1951:6.

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[476] required to build the short pig fence protecting the average garden. A house is replaced by intermittent work on construction over a period of several weeks.

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614 Co-operation with households outside the expanded family is usually on the basis of assistance given for a day or two by an individual to fulfil some kinship obligation or to help a neighbour who is sick. Any assistance a man receives usually comes from individual kin rather than a working party composed of his agnates. This may be because Sivepe is one example of the type of Melanesian societies where clans or their segments 'are small and communities composed of several, permitting local endogamy' and co-operation with local kin and affines dilutes the strength of the unilineal group (Brown 1962:68).

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[164] The work patterns we recorded are summarized in Table 4. The figure for the time taken up by sickness (including caring for the sick) was affected by the facts that during the survey 2 householders suffered from lengthy bouts of malaria (1 was hospitalized) and that some women needed to attend to their sick children; the figure for travel was affected by the absence for several days of 1 householder and his wife who walked to Popondetta where they had business at the District Office.

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[797] The extreme weather conditions experienced during our survey - 26.3 inches of rain in 1 month with 25 wet days followed by a long period without rain - restricted both the range of subsistence activities possible and to some extent the time available for them. The amount of time devoted to subsistence and cash crop gardening was appreciably lower during each of 3 weeks which were marked by the celebration of non-traditional festivals. Several villagers were among a group of 100 people baptized as Anglicans at Sasembata Mission.

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461 During the week this occurred the women of the sample devoted more time to preparing for and attending the ritual than to economic activities. The men also spent more time than usual in the village, several of them building or repairing houses. Most of the men spent several hours watching the baptism itself. Although the baptism differed from the life-crises traditionally celebrated by feasts, a number of small independent gatherings to mark the transition were held afterwards in the village by the close kin of those baptized.

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461 Religious observances were accorded a little more time during the week of Christmas than in normal weeks. There were no festivities within the village to mark the occasion and church attendance was the only organized Christmas celebration except for ceremonial at Saiho which a few Sivepe people attended on Boxing Day. Several people were disabled by attacks of malaria at the time but few of the others considered these 2 days as

Appendix C

Monthly rainfall for Awala, 1955-62 (inches)*

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1955	21.48	12.15	17.71	5.51	11.47	2.35	7.17	7.26	16.91	5.50	18.33	19.03	145.07
1956	14.16	13.85	6.22	12.76	3.92	2.41	10.27	4.76	11.45	8.42	16.17	20.61	125.00
1957	9.08	11.36	34.80	19.05	10.55	8.29	4.85	11.55	12.12	8.88	24.03	27.14	181.70
1958	24.90	18.27	23.11	17.59	6.51	13.06	4.14	8.53	22.30	15.86	8.52	23.45	186.24
1959	11.32	24.58	8.17	23.30	15.11	14.22	11.56	2.63	11.60	5.64	12.21	21.65	161.99
1960	25.67	22.70	11.41	17.10	11.29	13.62	4.29	8.69	11.67	15.26	19.35	18.64	179.69
1961	23.06	9.46	9.84	10.02	10.94	12.72	10.14	11.80	11.66	11.21	13.78	10.20	144.83
1962	4.54	23.89	13.60	11.72	17.51	9.65	10.92	10.20	8.29	13.84	9.35	26.33	159.84
Av.	16.77	17.03	15.61	14.63	10.91	9.57	7.92	8.18	13.25	10.58	15.22	20.88	160.55

Days when rain fell

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1955	24	19	19	19	19	8	18	17	17	12	24	23	219
1956	19	23	20	23	11	11	15	19	21	21	18	20	221
1957	20	17	26	21	13	9	21	18	18	17	18	21	219
1958	22	19	27	25	13	22	13	13	21	19	18	28	240
1959	21	25	22	25	20	24	18	12	18	14	21	23	243
1960	25	25	23	23	14	18	8	18	11	22	21	23	231
1961	25	16	22	21	22	17	11	17	13	18	20	24	226
1962	12	21	19	20	16	11	8	10	8	16	10	25	176
Av.	21	21	22	22	16	15	14	15	16	17	19	24	222

*Figures supplied by Mr C.E. Searle.

(b) Climate

According to Köppen's climatic classification (Köppen and Geiger 1930) the whole area falls within the Af category (humid tropical lowland), the uniformly high temperatures and rainfall providing a long growing season calculated by the CSIRO to be effectively twelve months in 9 years out of 10.

Two seasons, commonly referred to as 'wet' and 'dry', are definable in terms of wind direction, rainfall and humidity and are clearly recognised by the Orokaiva. The 'wet' season, from December to March, is characterised by north-easterly or north-westerly winds, high temperatures and humidities and late afternoon thunderstorms. The 'dry' season, from May to October, experiences north-easterly winds, lower temperatures (particularly at night),¹ less cloud cover and more irregular rainfall, both in frequency and intensity.

The mean annual rainfall almost everywhere exceeds 100 inches, increasing inland to 157.6 inches at Awala on the lower slopes of Mt Lamington. The wettest and driest months are December and July respectively, the precipitation ratio between the two being in the range of 5:1 or 5:2. The rainfall pattern is not strongly seasonal by Papua-New Guinea standards and the element of seasonality decreases from the coast inland, from a coefficient of seasonal variation of 0.34 at Buna to 0.27 at Awala. Further, the deviations from the mean reveal that there is only a moderate variability of rainfall; nevertheless it (as revealed in Table 1:1) has considerable bearing on the rhythm of agricultural activities and economic life in general. While the pattern of food production clearly varies with the two dominant seasons,² the time-consuming tasks of clearing bush and establishing new gardens show no definite pattern other than a close association with the occurrence of dry periods. Thus the availability of labour and its application demand some flexibility to accord with the vagaries of weather.

¹ Mean maximum temperatures over the year are in the range of 83° to 88°F., relative humidity at 9 a.m. is 80 per cent falling to 72 per cent at 3 p.m., and mean minimum temperatures are from 65° to 70°F. These figures are derived from observations made at Sivepe on the lower slopes of Mt Lamington. Temperatures can be assumed to be 50°F. higher at the coast and the diurnal range slightly less.

² Distinguished by the Orokaiva as garepa - the wet season - when the staple taro (Colocasia) is in production, and huvira - the dry season - when the people must resort to sago, breadfruit and less favoured foods.

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Table 1:1

Fopondetta sub-district: some rainfall characteristics
(inches)

	Station		
	Buna* (28 yrs)	Fopondetta* (8 yrs)	Awala** (11 yrs)
Mean annual rainfall	120.37	93.64	157.57
Standard deviation	20.13	13.94	19.40
Coefficient of seasonal variation	0.34	0.32	0.27
Mean month: wettest	14.31 (Dec.)	14.05 (Dec.)	20.37 (Dec.)
driest	4.24 (Aug.)	2.96 (Jul.)	7.78 (Jul.)
Extremes: mean wettest			
Max.	33.57	16.82	27.14
Min.	3.70	8.99	10.20
mean driest			
Max.	14.61	10.67	11.56
Min.	0.03	0.08	4.14
annual			
Max.	167.80	109.38	186.34
Min.	70.17	69.98	125.00

Sources. * Commonwealth Bureau of Meteorology, Melbourne.

** Mr C.E. Searle, Awala Estate.

241 cultivators in New Guinea.¹ This was due partly to changing emphases in the pattern of work between the two surveys, particularly the greater amount of time used for external agencies and in the inception of two communal enterprises (the establishment of a cash crop garden and preparations for the transfer of the village to a new site). Three other factors must be taken into account. [25] Firstly, a slightly different survey technique was employed by Rimoldi. The 1964 measurements were confined to a single point in time, whereas Rimoldi measured all the gardens and then added any extensions which occurred during the survey period (about six weeks) without deducting any areas which might have gone out of production. Secondly, 1964 proved to be a highly unseasonal year at Sivepe in that recorded rainfall in August exceeded that in December (1,542 and 1,416 points respectively) and the number of rain days was the same in each month (24). This disrupted the cycle of agricultural activities and prevented the customary clearing of forest for new gardens during dry weather. For this reason, figures for areas planted but not producing (see Table 4:1) approximate closely to Rimoldi's, whereas cleared and producing areas fall far short. Thirdly, two household heads within the group surveyed in 1964 had been absent from the village for two to three months before the data were collected, and third's activities were partially diverted by his involvement in a contract to build a house at Saiho hospital, and most of the community were involved for several weeks in building the new road to Sasembata and in erecting classrooms on the mission station.

245 (b) Economic trees and livestock

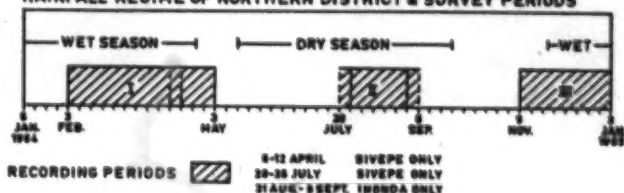
The holdings of economic trees (Table 4:3) indicate their importance for subsistence. Breadfruit comprises a very large proportion of the intake of starches at the onset of the dry season and only when most of it has been harvested do the people resort to sago-making. Areca is chewed by almost all adults, while the milk of the green coconut is drunk as refreshment and the meat grated to use in preparing staple foods. Hauga (Canarium sp.) nuts, when in season, are gathered and consumed largely by children.

[136] All economic trees, except for the recently introduced orange, grow wild in the bush but are claimed as individual property. Several, particularly coconut, areca palms and hingi trees, are also planted in gardens and on the periphery of the village.

¹ See Barrau 1958:32; Brookfield 1962:245, 251; Bureau of Statistics 1963:14.

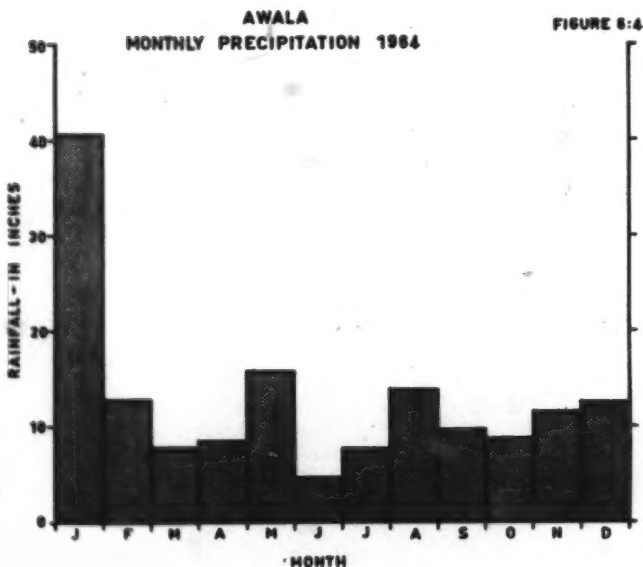
[132] ² Similarly, a long unseasonal dry spell occurred during the last few weeks of Rimoldi's survey with the consequent extensive clearing of land for new gardens.

FIGURE 3:1
RAINFALL REGIME OF NORTHERN DISTRICT & SURVEY PERIODS



On account of periodic variations in the size of the samples and so in the number of man-days covered in each survey week (due to permanent arrivals and departures plus temporary absences), activities performed are everywhere expressed in terms of 'hours per man-day' and 'per man-week' actually resident, residence being defined as including time spent sick. This conversion of all data from totals to means obscures the distinction between activities occurring regularly, such as subsistence gardening, and those which occur only sporadically, for example, house construction, particularly where the latter are characterised by short periods of intensive work. However, the conversion does permit realistic estimates to be made of the labour requirements of different tasks over extended periods.

All the data, with the exception of those involving absences in excess of twenty-four hours from the village and periods incapacitated through sickness, were recorded on punch cards and processed by computer. However, in the case of absences and sickness the data were of a more imprecise nature and only simple manual analyses were carried out.



much time is spent in planting and, more particularly, maintenance, unlike the other crops, which suggests that their labour requirements are much lower.

In spite of the atypical weather experienced during 1964, harvesting patterns vary for the several crops. While time devoted to taro cultivation always exceeds that of the other two crops, harvesting falls off markedly during the dry season. In contrast, the time devoted to the harvesting of sweet potato increases steadily through the survey, while that of yam is confined almost entirely to the wet season when large quantities are stored in specially constructed yam houses (or occasionally in holes in the ground).

As with the sweet potato and yam, work on the minor crops and economic trees is restricted almost entirely to harvesting their products - 1.6 hours per man-week. Ins, pitpit, bananas, sugar-cane, areca, coconuts and breadfruit are the major items in this category.

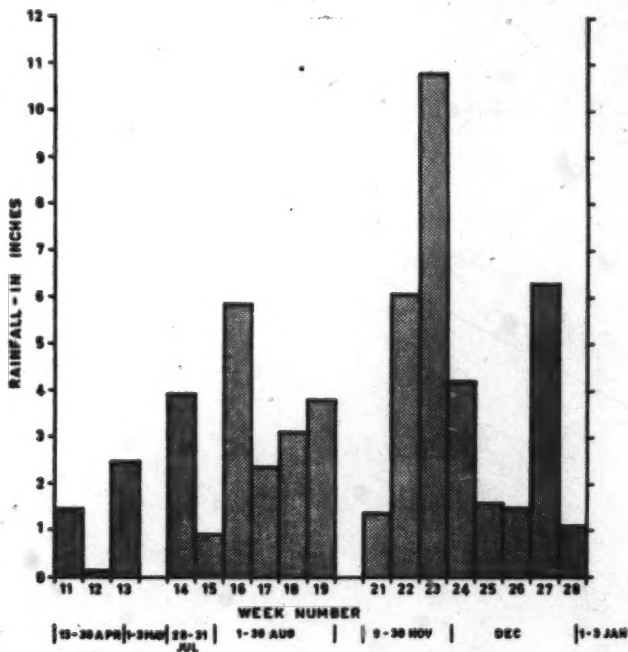
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[221]
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SIVEPE

WEEKLY PRECIPITATION (WEEKS 10 TO 28 ONLY)

FIGURE 8:5



512 Some, such as coconuts, bananas, areca and ina, are gathered throughout the year, but pitpit is collected and eaten primarily during the latter part of the wet season, while the harvesting of breadfruit is confined almost entirely to the dry season. It is at this latter time alone that activities connected with the minor foods assume some importance. During period II, 3.4 hours per man-week were devoted to the harvesting of other crops and products, over 60 per cent of this being for breadfruit alone.

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134 (v) The Avalanche Association consists of riverine deposits
of gravel and boulders interbedded with sheets of sand, lying on
[197] the floor of the Girua river. It occupies a very small pro-
portion of the Inonda lands, supports a kumai vegetation, and
appears to have no potential for either agriculture or forestry.

132 Climate: The climate is hot and moist, except for a
hot, relatively dry season which lasts from about July to Sep-
tember. Because of the influence of the Owen Stanley Ranges
there is a rapid west-east decline in rainfall over the Orokaiva
area. Popondetta has an average annual rainfall of 96 inches so
that Inonda, lying 5 miles to the east, probably has a rainfall of
80 to 90 inches. The yearly pattern of rainfall distribution,
which is very similar for both Inonda and Popondetta, can be
seen from the rainfall recordings for Popondetta given in
Appendix C_x⁽¹⁾

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821 The Inonda people refer to the dry season as huvira
because the huvira tree (*Erythrina indica*) flowers at that time.
The wet season is divided into a number of periods which are
recognized by the ripening of various nuts (especially hauga) and
edible pit-pit (ina), and by the flowering of the garepa tree.
For instance, the garepa season begins about November or De-
cember and lasts for two or three months. These are the
wettest months of the year and plant growth is therefore rapid
at that time. The pasiro (a variety of pit-pit) ripens about
[541] March, which is a time of more moderate rainfall. Food is in
abundance at this period, and it is accordingly the most popular
season for feasting.

132 The warm moist climate is generally favourable for
241 plant growth, but because many of the soils are coarse in tex-
ture and have low water-holding capacity, even short periods of
drought may adversely affect the growth of shallow rooting crops
(including the staple food, taro). Deep rooting crops such as
coffee, cocoa and coconuts are less affected by the dry periods.

(1) This average was computed from recordings taken over the 7 year period
1955-61.

A [See Category 132, p. 100--Analyst]

APPENDIX C

Monthly rainfall for Pongolatta 1955-61 (inches)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
1955	7.58	12.05	2.11	7.88	12.65	6.13	2.67	1.85	6.55	4.90	19.78	10.36	94.41
1956	8.31	8.18	5.56	6.70	1.16	2.08	2.10	3.23	5.74	5.94	9.23	14.42	72.02
1957	7.41	4.04	17.40	7.60	4.33	2.95	1.91	3.90	5.30	10.60	7.14	16.82	89.60
1958	15.99	4.24	14.04	11.79	4.77	6.46	2.11	1.98	5.86	10.10	10.62	12.37	103.53
1959	8.98	16.32	9.82	17.09	8.29	6.61	3.84	0.78	8.06	4.64	9.89	12.98	102.32
1960	13.01	10.63	11.57	12.30	3.41	4.87	2.61	8.70	3.26	8.79	12.76	10.66	102.51
1961	20.34	7.20	7.04	14.80	7.12	8.25	3.50	2.27	5.93	11.79	6.30	14.64	109.18
Average	12.09	8.95	9.64	11.17	5.96	3.34	2.68	3.24	5.85	8.11	10.62	13.19	94.22

Number of wet days per month for Pongolatta 1955-61

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
1955	14	14	10	16	13	19	10	4	13	8	21	17	163
1956	18	18	13	27	8	22	12	12	9	10	12	11	172
1957	11	13	21	25	13	16	7	12	14	13	17	21	183
1958	21	16	24	21	16	16	12	9	13	20	22	26	216
1959	16	24	16	24	16	18	13	6	13	10	25	21	202
1960	27	22	21	19	16	10	7	15	10	24	21	18	210
1961	29	17	20	18	22	8	18	14	15	16	16	18	211
Average	19.4	17.7	17.9	21.4	15.1	15.6	11.3	10.3	12.4	14.4	19.1	18.9	195

14: Crocombe & Hopkin E-5 (no date) 1963 OJ23 Orokalwa OJ23
Inonda

Appendix B

The Ombi-Tara environment and population

131 Ombi village is in the Kokoda sub-district about twenty-seven
[133] miles from Popondetta along the main Popondetta-Kokoda road. It
is situated on top of a plateau up a steep escarpment, about 250
yards from the main road. Tara is about two miles from Ombi and
straddles the access road which runs through the converted land
occupying part of two of the blocks. It was previously about two
miles further away and was moved to its present site in 1964 after
survey of the land to be converted was under way.

133 The Kumusi River flows close to the Popondetta-Kokoda road,
[361] about four hundred yards from Ombi village. Ombi village was
formerly sited next to the river but was moved to its present
higher location in about 1957, reportedly to escape the mosquitoes.

871 The nearest school is conducted by the Administration at Ajeka,
972 about two miles away. Most children of the appropriate age attend
school daily. Several of the older children board at schools in
[368] Popondetta while some children do not attend school at all.

366 The nearest trade store is at Ajeka but this is seldom open,
438 and most purchases are made from the store operated by a European
439 planter at Awala, a distance of seven miles. Clothing and larger
items are purchased in Popondetta.

134 The Ombi-Tara lands are part of the Higatura land system which
contains a considerable proportion of good land with reasonably
fertile soils, suitable for many arable or tree crops as well as
pasture.¹

●132 The most important features of the climate are the generally
137 heavy rainfall, and the almost uniformly high temperatures and
humidities throughout the year. Rainfall ranges from 120 to 150
inches annually and may well be greater in the higher areas, includ-
ing Ombi-Tara. These climatic features are reflected in abundant
plant growth. At Ombi-Tara rainforest covers much of the surround-
ing land, which is marked by a series of steep ridges.

¹ See C.S.I.R.O. 1964.

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[A villager shows off the fighting head-dress of his father. It is intricately made of boar tusks, shells, feathers, and hornbill beaks.]

THE YEGA OF NORTHERN PAPUA

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THE Yega is a group of nearly 900 people living in sixteen settlements, on an area of about twelve square miles, on the north coast of Papua. They live on a gently sloping alluvial plain between Mt Lamington and the sea. Yega territory is bounded by one large stream and crossed by several small creeks.

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The plain was originally covered by mature rain forest 100-120 feet high, interspersed with elongated strips of grassland. Now, much of the original forest has been cut down, and secondary forest forty to fifty feet high has replaced it. The climate is hot and wet throughout the year (Köppen Af) but there is marked seasonality of precipitation. The north-west monsoon, November to April, brings two-thirds of the annual rainfall (average 100 inches per year); July and August with about four inches per month are relatively dry. The temperature is over 80°F on most days and rarely falls below 70°F on the coolest night, but the heat is alleviated by north-easterly sea breezes which blow during the afternoon and evening throughout the year.

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The first reported contact between Europeans and Yega was during an expedition along the coast by the Lt Governor of Papua, Sir William McGregor, in 1893, but the first real step in the process of change occurred with the establishment of an Anglican mission school on Waususu Point in 1909. From this time until the outbreak of World War II, Yega men began leaving their villages to work

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[P.5-A)

- [12] these changes have had on the physical environment, especially topography and natural resources.

Section 2: Climate

- 132 The temperature varies between 70° and 90°F. throughout the year, both in Sivepe and Inonda. The Inonda people think that the nights at Sivepe (and on the mountain generally) are rather cold and it is true that in Inonda night temperatures are noticeably higher. The temperature also fluctuates slightly with the season, being higher just before and during the wettest season, i.e., from September to February. The Orokaiva like the sun to shine strongly. They think a strong sun heals the sick and they like working in the sun. One recurring theme in spells to improve the growth of taro is that the sun should shine strongly. This puzzled me a little at first, but students of swidden agriculture seem to be agreed that the fertility of the gardens depends considerably upon the dryness of the weather during the period when gardens are cleared and the felled vegetation burnt. (See, for instance, Geertz, 1966: 22-23.)

- [821] Rainfall varies considerably from place to place, month to month and year to year. I have quoted some data, for Popondetta and Awala, extending over a number of years. Inonda rainfall is somewhat below that of Popondetta; Sivepe rainfall is significantly higher than at Awala. Thus Inonda usually gets 80 to 90 inches of rain per year while Sivepe gets at least 200 (Tables 3 and 4). Europeans tend to divide the year into a "wet" and a "dry" season. This is not a very accurate division and Orokaiva do not use it. It rains some days in every month and the notion of a dry season can be arrived at only statistically; it will then be seen to fall in June-August at Awala and Sivepe; in May-September at Popondetta and Inonda. This dry period, for the Orokaiva, is the clearing [241] and planting period par excellence. The Orokaiva know that the best harvests occur if it rains little during this operation. They may not be able to explain this by the fertility gained from the ash (they think it is the sun that gives the fertility gained from the ash) but one does notice a certain sense of urgency at this time of year to attend to clearing and planting.

- 132 In October the heaviest rains begin and this is the period when crops grow fastest. Thus the crops planted during the dry 241 period are apt to develop particularly well while crops planted earlier are able to mature. It is true that planting and harvesting continue for most of the year but the rainfall variations do influence the yield of taro planted at different seasons; hence the Orokaiva do have a clear notion of optimal seasons for certain operations. The dry period is the optimal planting period, while the months preceding are the period of optimal harvest.

241 planting is already completed for when the old people see the
221 tauga leaves drop over the newly planted gardens they say that the
824 taro will have good leaves; their virtue is said to come from the
tauga leaves that drop. The driest part of the year is now at hand
and few taro shoots suitable for planting are developing; hence,
the best planting time is past.

● [132] 6. The flowering of the tauga announces the beginning of the
rainy season. This falls around the beginning of October.

[77] 7. At about Christmas, immature tauga nuts begin to fall from
the trees. This is the beginning of the time of shortage and also
the occasion of some further garden magic to encourage the swelling
of the main taro crop. Some minor feasts occur around this time.
People then begin to look forward to the time the garepa will flower
again.

241 We may compare this with Waddell's statistical data, which
compares man-weeks spent on all types of activities in Sivepe over
the periods 3 February-3 May, 1964; 20 July-6 September, 1964; and
9 November, 1964-3 January, 1965. His figures do not rally particu-
larly closely with the ideological pattern set out by informants
and he explains this by an untypical rainfall pattern in 1964;
it was unusually dry.

Rainfall fluctuations have a profound effect on the yield
of the main crop taro. Because of the porosity of the ground,
very heavy rainfall is needed to ensure a good harvest. Feasts
can be held only in years when the rainfall has been good and the
harvest accordingly abundant. In other years people are close to
starvation level in the months before the harvest. It is then they
rely on supplementary crops such as sago.

805 In recent years, two further calendars have become superimposed
upon the traditional one: that of the Christian festivals and that
[43] of the European economy, notably monthly coffee sales from June to
December and the payment of Local Government Council tax supposedly
[65] in September.

Section 3: Topography

121 In this section I shall specifically describe the differences
in topography between Sivepe and Inonda, but this description will
illustrate at the same time the fundamental differences between the
ecological base of Orokaiva mountain settlements such as are found
on the slopes of Mount Lamington and of the plains settlements found
North and East of the mountain. I have drawn my data from a regional
land and soil survey done by the Commonwealth Scientific and
Industrial Research Organisation in 1954, as well as from remarks
of Crocombe and Hogbin (1963) and Rimoldi (1966).

Section 2: Physical Environment

131 The present territory of Hohorita stretches from near Mount
133 Lamington (an elevation about equal to that of Sivepe) down to Double
Crossing, which is about 600 feet above sea level. Rainfall at the
132 top of the territory may be close to that of Sivepe, but further down
it decreases--though I doubt whether it would fall much below 150 inches
per year anywhere on Sangara territory. The land yielded much the same
361 wild and cultivated crops as in Sivepe. Before the eruption, the
concentration of population was entirely at the higher reaches of this
territory, while the lower parts were used for hunting and other
subsidiary activities. Those who survived the eruption because they
were away from their villages were often hunting on this lower land.
Today, the pattern of occupation has shifted. The lower part of the
territory, near the new villages, is intensively used while the more
elevated land is used a little less and often for coffee rather than
subsistence crops.

731 The eruption has made minor changes to land contours: due to
the floods, the watershed of the Ambogo River was gouged out forming a
number of pools of stagnant water which formed a breeding ground
for mosquitoes and leaches. These pests are blamed on the eruption by
the local people. On the credit side, certain varieties of bananas
and pumpkins, planted before the eruption, had the opportunity to
grow wild during the year the land was unoccupied and are now thought
of as having been brought to the district by the eruption.

162 The total Sangara population today would be about 472--of which
350 live in Hohorita and the rest in the three other villages. The
161 total land holdings of this population extend over 3.5 square miles--
an average of about 135 per square mile. This places the Sangara in
a somewhat superior economic position to Sivepe, which has to support
at least 180 persons per square mile on land of the same quality. It
must be remembered that prior to the eruption, the Sangara population
was six times as large as it is today--so that Sangara must have
suffered a chronic land shortage. All the neighbours of the Sangara
are agreed that they were very warlike and dangerous enemies; they
probably were in frequent need of extra gardening land. Today, they
have enough land not only for subsistence gardening but also for a
somewhat larger cash-cropping programme than is generally found in the
Sasembata district.

621 The present site of Hohorita (see Map XIV)^A developed in several
stages. First the Horeopa clan, which had the greatest number of
361 survivors and therefore achieved dominance, shifted to the front part
of Hohorita village in 1956. The mission station was established
next to the village, separated from the village by a small stream.
By 1958, all the Horeopa were settled in houses in the new village,
together with the Oripa clan whom they had asked to join them while
all the other inhabitants of Irihambo had shifted to the new mission
A [See Cat. 116, p. End Map 13--Analyst]

TABLE 3

MONTHLY RAINFALL FOR AWALA, 1955-62 (INCHES)*

Source: Rimoldi, 1966: 109

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1955	21.48	12.15	17.71	5.51	11.47	2.55	7.17	7.26	16.91	5.50	18.33	19.03	145.07
1956	14.16	13.85	6.22	12.76	3.92	2.41	10.27	4.76	11.45	8.42	16.17	20.61	125.00
1957	9.08	11.36	34.80	19.05	10.55	8.29	4.85	11.55	12.12	8.88	24.03	27.14	181.70
1958	24.90	18.27	23.11	17.59	6.51	13.06	4.14	8.53	22.30	15.86	8.52	23.45	186.24
1959	11.32	24.58	8.17	23.30	15.11	14.22	11.56	2.63	11.60	5.64	12.21	21.65	161.99
1960	25.67	22.70	11.41	17.10	11.29	13.62	4.29	8.69	11.67	15.26	19.35	18.64	179.69
1961	23.06	9.46	9.84	10.02	10.94	12.72	10.14	11.80	11.66	11.21	13.78	10.20	144.83
1962	4.54	23.89	13.60	11.72	17.51	9.65	10.92	10.20	8.29	13.84	9.35	26.33	159.84
Av.	16.77	17.03	15.61	14.63	10.91	9.97	7.92	8.18	13.25	10.58	15.22	20.88	160.55

DAYS WHEN RAIN FELL

1955	24	19	19	19	19	8	18	17	17	12	24	23	219
1956	19	23	20	23	11	11	15	19	21	21	18	20	221
1957	20	17	26	21	13	9	21	18	18	17	18	21	219
1958	22	19	27	25	13	22	13	13	21	19	18	28	240
1959	21	25	22	25	20	24	18	12	18	14	21	23	243
1960	25	25	23	23	14	18	8	18	11	22	21	23	231
1961	25	16	22	21	22	17	11	17	13	18	20	24	226
1962	12	21	19	20	16	11	8	10	8	16	10	25	176
Av.	21	21	22	22	16	15	14	15	16	17	19	24	222

*Figures supplied by Mr. C. E. Searle. Awala lies three miles northeast of Sivepa.

TABLE 4

MONTHLY RAINFALL FOR POPONDETTA 1955-61 (INCHES)

Source: Crocombe and Hogbin 1963: 100

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1955	7.58	12.05	2.11	7.88	12.65	6.13	2.67	1.85	6.55	4.90	19.78	10.26	94.41
1956	8.31	8.15	5.56	6.70	1.16	2.08	2.10	3.23	5.74	5.94	9.23	14.42	72.02
1957	7.41	4.04	17.40	7.60	4.33	2.95	1.91	3.90	5.50	10.60	7.14	16.82	89.60
1958	18.99	4.24	14.04	11.79	4.77	6.46	2.11	1.98	5.86	10.10	10.62	12.57	103.53
1959	8.98	16.32	9.82	17.09	8.29	6.61	3.84	0.78	8.08	4.64	9.89	12.98	102.32
1960	13.01	10.63	11.57	12.30	3.41	4.87	2.61	8.70	3.26	8.79	12.76	10.66	102.51
1961	20.34	7.20	7.04	14.80	7.12	8.25	3.50	2.27	5.93	11.79	6.30	14.64	109.18
Av.	12.09	8.95	9.64	11.17	5.96	5.34	2.68	3.24	5.85	8.11	10.82	13.19	96.22

NUMBER OF WET DAYS PER MONTH FOR POPONDETTA 1955-61

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1955	14	14	10	16	15	19	10	4	13	8	21	17	163
1956	18	18	13	27	8	22	12	12	9	10	12	11	172
1957	11	13	21	25	13	16	7	12	14	13	17	21	183
1958	21	16	24	21	16	16	12	9	13	20	22	26	216
1959	16	24	16	24	16	18	13	6	13	10	25	21	202
1960	27	22	21	19	16	10	7	15	10	24	21	18	210
1961	29	17	20	18	22	8	18	14	15	16	16	18	211
Av.	19.4	17.7	17.9	21.4	15.1	15.6	11.3	10.3	12.4	14.4	19.1	18.9	193

Note: Popondetta lies 11 miles west of Inonda.